DOCUMENT RESUME

ED 217 353 CG 015 959

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TITLE Women, Work and the Scientific Enterprise.
PUB DATE 81
NOTE 31p.; Paper presented at the Annual Conference of the Association for Women in Psychology (8th, Boston, MA, March 5-8, 1981).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Cognitive Style; Employed Women; *Females; Feminism; Higher Education; Nontraditional Occupations; *Occupational Aspiration; *Psychological Characteristics; Responsibility; *Science Careers; Sciences; *Sex Differences; State of the Art Reviews; *Technology; Work Environment

ABSTRACT

A pressing issue facing women is their role in science and technology, two fields in which knowledge has traditionally been produced and controlled by men. If women were to take responsibility for science and technology, the nature of scientific inquiry and scientific organizations might be fundamentally different. Women must take this responsibility; science and technology are too powerful to be controlled solely by men. The addition of more women in the traditionally male profession is not enough, and women cannot be satisfied with supporting roles in male enterprises. The male work world is alien to feminine psychology and stifling to the woman's creative functioning. It is time to analyze the consequences of the social environment provided by male science, the fundamental differences between male and female psychological functioning, and the meaning of both to the future of science. Science profoundly affects the quality of lives of women as well as men. The formation of women's science collectives may provide women with the environment they need to take responsibility for science and technology. (Author/NRB)

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Women, Work and the Scientific Enterprise

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Fall 1981

CG 015959

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Women, Work and the Scientific Enterprise

One of the most pressing issues facing women and the Women's Movement is the role of women in science and technology. In this paper I will examine, in both a personal and theoretical manner, what it means to be a woman in the public sphere of work, science and technology. Four points will be made. 1) For a variety of cultural reasons the psychology of men and women is different in several fundamental aspects. From its earliest inception, scientific and technological knowledge has been produced and controlled by men. If women were to take more active responsibility for science and technology the nature of scientific inquiry and scientific organizations created by and for women might be fundamentally different. 2) Science and technology are too useful and too powerful to be left solely in the hands of men and patriarchy. Women can no longer passively relinquish the power of science to men and the psychological stance to life that characterizes those men. Nor can we continue to be satisfied with only a support role in male enterprise. As women, because we are women, we must take more active responsibility for science and technology. 3) The shaping and control of science by women requires more than the addition of more women in the traditionally male profession through affirmative action or non-sexist educational policy in the public school system. The work world created by and for men is alien to feminine psychology and deadly to the creative functioning of women. We can not fully succeed, or even survive, as scientists within male scientific institutions. 4) I propose that the formation of women's science collectives may be a successful strategy towards providing women the human and work environment they need in order to take responsibility for science and the destiny of our species.

For the last eleven years of my life I have been striving and sometimes even succeeding to be a scientist. As a physiological psychologist I have been trying to understand how the billions of cells that make up the central nervous system work together to produce action, thought and feeling. Over the last few years I have begun to see that the personal difficulties I was facing as a scientist had more general implications. A first step to wisdom is to understand that one's own personal issues have broader sociological and psychological significance.

There have been many periods during those eleven years, during which I felt a deep sense of failure, hopelessness, disappointment, self-blame and a vague anger. Until quite recently I believed my inner psychological life as a scientist and professional were unique to me and my perceived failure to contribute to the scientific enterprise had to do with some deep tragic flaws within me. It never occurred to me that my experience of myself as a scientist and productive worker in the public sphere, nor my experience of scientific institutions, might be gender-related. My purpose here is to describe my observations of the psychological life and strategies of women workers, like myself, and relate these personal observations to broader psychological and political analyses that have recently emerged from contemporary feminist thinkers such as Nancy Chodorow (1978), Evelyn Fox Keller (1978) and Dorothy Dinnerstein (1976).

For the first time in human history more than a few women are entering the sciences as students. Many have continued on as professional scientists, professors and physicians. Much of this change seems to be a post-war phenomenon. Something happened to the country at the end of the second world war.

A post-war optimism swept across the nation; a cultural and national sense that anything is possible. The middle class men and women who parented my generation believed that their children, born in the post-war years, could have and do anything and everything they wished, even be President, if they simply worked hard enough and persisted in their goals.

While it is true that sex-role stereotyping was in its hey-day during the late 1940s and 50s (girls were expected to look pretty and play with dolls), it is also the case that we women, as girls in the late 40s and 50s, were sent a powerful message that everything is possible. Education is the means to nearly all ends. For many of us as high school students, going to college was an inevitable consequence of graduation from high school. Our education and our potential were valued. As adolescents we received holiday gifts from our parents that gave this message some tangibility. Chemistry sets, invisible man and, later, invisible woman were purchased and presented not only to our male siblings, but to ourselves. We read Nancy Drew and Landmark books about Madame Curie and Florence Nightingale. For many of us, a tomboyish exploratory spirit was not only amusedly tolerated, but even encouraged.

Many of us proceeded through the college application process, left home and entered the University. Some of us found ourselves in private elitist institutions for women. We were the lucky few. It was in this rarified environment that we began to take ourselves seriously as thinkers, intellectuals, and doers. It was more difficult to learn to take oneself seriously in the large, patriarchal institutions as "coeds". But if, by chance or some special social skill, a professor or group of peers took us seriously, we had the chance to experience first hand the meaning of finally "making it" as a woman professional.

Many of us knew early on that college was just the beginning. There would be graduate school, medical school, law school or business school after. We had only a vague notion of ourselves as successful women professionals, of self-actualization, power and commitment to a purpose larger than ourselves. Around us there were few models by which we could verify the reality of our nebulous fantasies. But the scarcity of female models did not concern us. After all, we were the new liberated generation, free of the limitations and psychological handicaps of our parents' generation. We saw ourselves as masters of our own professional destiny. In the new world of which Betty Freidan spoke, where women were no longer relegated to the home, the abundance of male models seemed adequate enough.

It never occurred to most of us to think that our gender, our femaleness, could or would stand in our way. Sex discrimination in the university seemed only to be a childishly charming relic of the past. Only our own personal flaws could stand in our way. Secretly, perhaps, we feared that we might not be "bright" enough or lacking in sufficient self-confidence, verbal skills, emotional stability, drive or self-discipline. But then it seemed that only ourselves and our private tragic flaws could prevent us from assuming an important position in the adult world of creative workers.

Some of us received acceptances for the small number of medical or graduate school positions allotted for women. Some of us managed the four or six years of the period of passage, ending in a degree and entrance into a professional career, but many of us who began, did not. I have known many women who have left graduate or medical school in fear of facing competence examinations or despair over a so-called "writing block". I have known women, who after years of daily viscera-gnawing anxiety, mumble that they are "still working on their dissertations".

Those of us who stayed were those who somehow received the intellectual and emotional support necessary to complete all the steps. Perhaps there was a paternal male advisor, a fellow student, a parent or other women students who formed "support groups". Or, perhaps, that magic thing that happens so often to our male counterparts happened to us. We became captivated by the very subject matter or problem we were studying. It was this captivation that carried us through long periods during which it became apparent that few around us were very interested in what we were doing as scientists, thinkers and writers.

Many of us, now in our thirties and forties, somehow completed the process, appended letters indicating our credentials behind our names, and thought ourselves prepared to claim our share of grant support, fellowships, faculty positions, salaries, promotions, administrative power, laboratory and office space. For us, just beginning our careers, it seemed that making an impact on the scientific world and claiming our place in the policy-making power hierarchy depended only on hard work, persistence, drive and self-discipline.

What I believe has happened to many of us is a slow, tortuous realization that we are having little impact on the world, that our committment to a purpose higher than ourselves is waning. A dull anxiety prevents us from recapturing that earlier and noble fascination with ideas and complex problems. We find it harder and harder to take ourselves seriously, as thinkers and creators, and notice that those around us, our male colleagues. fail as well to take us seriously. But we do not look to others on whom to lay blame. We blame ourselves and our private tragic flaws that seemed always lurking in the background.

But what and who is it that surrounds us now in our scientific and professional worlds? It is mostly men. As one ascends the power hierarchy of most professions, one sees fewer women and more men. At the undergraduate women's college where I teach, nearly 50% of the faculty are women. At the prestigious biomedical research institute where I spent a post-doctoral year, only two of the fifty research scientist faculty were women. Both were married to two of the most influential male faculty in that institute.

Many of us wonder what has happened to our energy, our sense of purpose, our self-assurance as thinkers and problem solvers. Often the answers are full of self blame. If I had worked harder and had more self-discipline; if I had more technical training, if I had learned to program computers or designed electronic circuits or wrote more fluently or read and thought more quickly; if I were more assertive, decisive and articulate. Many of us experience on a daily basis a sense of failure and alienation.

There exist more than a few examples of women who have never experienced any of this paralysis of will and self-doubt and who have been enormously productive and important contributors to the scientific enterprise. These women quickly become household examples of the possibilities for women. Nevertheless, they are rare. What needs to be asked is who are these successful and self-assured women and by what sociological and psychological process did they arrive at such a state of productive activity. Before this question can be addressed, however, the psychological nature of patriarchal science must be understood first.

To strive to become a woman professional and do valuable work means to

strive for a place in and access to a part of the society that has incorporated into its very nature the quintessential properties of patriarchal culture. The very word "science" implies masculinity. To want to create a permanent product from creative work and do this via the accepted route, means to want to be in a world of men; to work for, with and around men. Most of us, consciously or not, wanted to work with men, not for them or merely around them.

This wish has rarely been borne out in reality. Men and women working together in true cooperative spirit is rare indeed. For many men, a central goal of work, creative enterprise and personal endeavor is independence and autonomy. It is implicitly accepted that to become a successful scientist and to do good science one must do it alone. A psychology that feels most comfortable in psychological distance favors and condones an isolation from colleagues working on similar problems, working alone with a staff of assistants under him, who work for him and not with him. In some fields, the power of male bondage makes projects happen, events to occur and new solutions to emerge. But the popular, media image of the male worker and creator is a solitary beast, with a competitive spirit which pervades his feelings about his peers, either in the office across the hall or across the country.

Reflection on the writings of recent feminist thinkers suggests that the psychology of women is poorly suited to the solitary study of the nature of the world. Feminist writers in the fields of sociology, such as Nancy Chodorow, and psychology, such as Dorothy Dinnerstein, Jane Flaw and Evelyn Fox Keller have argued persuasively for the common sense idea that men and women's personality structures are fundamentally different. Nancy Chodorow, perhaps more than any other writer, has outlined for us a working theory which can

describe both the origins and the consequences of this fundamental difference in female and male psychological development.

Chodorow begins her argument with the fact that our primary caretaker during infancy and early childhood is, in nearly all cases across history and across cultures, a woman. She claims that this fact, perhaps more than any other, has enormous consequences for the basic psychological functioning of male and female human beings. That our mothers were women means that, for both male and female infants, our first, and therefore most important, social relationship is with a female member of the species. Our earliest actions, thoughts and feelings all occur within the intimate context of this first relationship with a female.

The human species is distinguished from other mammalian species by the lengthy period of infantile dependency, helplessness, and behavioral and neural plasticity. We experience our first emotions, ranging from intense joy to terror and despair, in the presence of and, in many cases, at the hands of a woman. Our first physical, emotional and cultural relationship is with a woman. Briefly summarized, Chodorow's thesis is that psychological development within the context of female-dominated infancy is very different for female and male offspring. For males successful emergence of an autonomous whole male self requires an unconscious and conscious denial of identity with this first social relationship. On the basis of data from psychoanalytic case studies she concludes, like Dinnerstein, that the process of separation and individuation during infancy involves, for the male child and male adult, a denial of dependence, intimacy and deep emotional connection with others. In so doing male psychology emerges as a "self-in-separation", seeking psychological wholeness in autonomy, independence, solitary endeavor and competition.

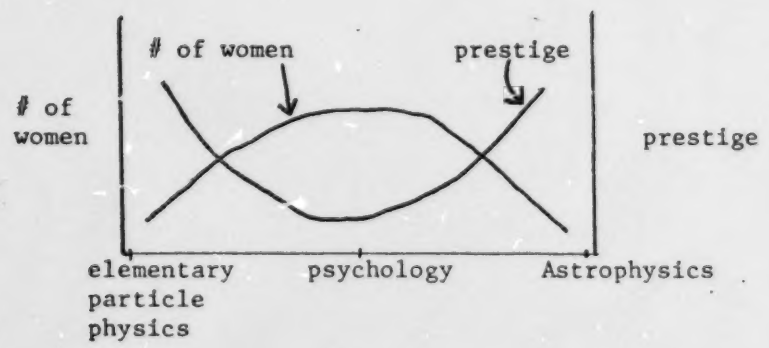
To become masculine entails denying everything that is female including that part of himself that evolved in relation to his female primary caretaker.

Chodorow argues that because her first intimate relationship is with a member of her own gender, the psychological development of the female infant and child is quite different from the male in both process and outcome. The development of self-identity and individuation from infancy does not require a girl to disavow identity with her first and primary caretaker. She does not need to deny her essential connectedness and the complex interdependence with others. Female gender identity does not require denial of the first relationship. Chodorow persuasively demonstrates that female children emerge into maturity as "selves-in-connection" and have a fundamentally different sense of herself and her relationship to others compared to her male counterpart. Jane Flax (1978) argues that qualitatively different developmental processes of males and females results in distinctly different psychological orientation in men and women as they emerge into adulthood following infancy, childhood and adolescence within institutionalized female-dominated infancy. For males, as "selves-in-separation" the development of deep and satisfactory intimate relationships is often difficult and painful, and in many cases simply avoided. For women, as "selves-in-connection" the very meaning of life seems to revolve around intimate human relationships. Maintaining autonomy and independence outside of intimacy may be a continuing and painful issue throughout adult life, particularly as social change urges her to enter into the patriarchal public sphere of work outside the family and home. From this perspective, the problem of life, simply put, is the continuing struggle to effectively balance our strivings for autonomy and

self-identity and maintaining intimate and nurturant connections with others.

Given Chodorow's and others' analyses of male and female psychological development and structure, it comes as no surprise that for many men the central purpose of life is to work, think, produce and create as an autonomous entity. Such a psychology thrives when working with and mastering things alone, without the help or presence of others. For many women, the purpose of life is to develop and nurture intimate relationships with others. Women find psychological wholeness in knowing others and being known by others. Work and human connectedness cannot be easily or happily separated.

Important scientific advances require a deep and persistent fascination with the subject matter being studied. An implication of Chodorow's analysis is that this fascination with things as opposed to people would be considerably easier for a self-in-separation than for a self-in-connection. It is relatively easy for a woman, scientist or not, to become fascinated with the ideas and problems of the human domain. When one tries to name recent prominent women scientists, the names of Margaret Mead, Karen Horney, Anna Freud, and Jane Goodall come to mind first. It is no accident, I believe, that listing the names of prominent women in psychology, anthropology and sociology is far easier than conjuring up names of prominent women in elementary partical physics or astronomy. The figure below is an attempt to show the relations among gender, social status and the nature of that which is studied in the various scientific fields.



Science implies masculinity. Yet there are levels of perceived masculinity within the various realms of scientific study. Inanimate science, the science of things, very large and very small, connotes the masculine. Fewer women are actively involved in elementary particle physics and astrophysics than in animate science, the science of life, both human and non-human.

One could reasonably conclude from Chodorow's work that, for very fundamental psychological reasons, inanimate science, the science of things, is less likely to attract the fascination and intellectual and emotional commitment of a woman than would animate science. The psychology of many women is poorly suited to the solitary study of small invisible objects and events or very large distant entities. This is a worrisome state of affairs, particularly now, when inanimate science and technology so far outstrips that of animate science. It is becoming increasingly more apparent that serious human problems can result from swift technological advances within the very masculine inanimate sciences.

The social environment of institutionalized science is well structured for, even epitomizes, the male personality that Chodorow describes. To strive to become a woman scientist, particularly within inanimate science, means striving for a place in and access to an important part of patriarchal society. To want to do something in this world via the conventional route means a desire to be in a world of men - in a world made by and created for selves-in-separation. Many women entering the professional world of men had a vision of science as vital, creative and important social activity. As we begin to infiltrate patriarchal science we begin to see how rare truly cooperative and noncompetive scientific activity is.

It is the rare man that can truly work with other persons as peers, equally sharing responsibility for the success or failure of the project undertaken. Recent feminist analyses, such as Nancy Chodorow's, would suggest that the problems and resistances that men have in working with women as peers and decision-making equals are even greater. Greater for many reasons; a too-close female presence can easily undermine a male's concept of self; a self in autonomy and individuated separation from the first and prototypic female, the mother. A woman working as a true co-worker may be psychologically engulfing for the typical successful male. Moreover, his success may originate from a greater-than-average need to reject interdependency and intimacy. Stated in the extreme, an encounter with true women peers and co-workers undermines his sense of individuated power and autonomy; she has the seemingly magic power to deeply know him and to force him to re-experience himself as dependent and merged with his original caretaker. Chodorow's claim that women, by their very femaleness, threaten men who are reared within the context of a female-dominated infancy may be overstated. In any case, it is difficult to verify by either personal experience or empirical methods. What may be of greater importance, at least for women struggling in the male world of science, is that the human environment provided by the patriarchal workplace is poorly structured to meet the intellectual or emotional needs of women.

As women in the patriarchal professional world, we are implicitly expected to thrive in a daily social context designed neither by or for women. We are expected to suddenly become selves-in-separation. We are expected to work alone, think alone, build alone and create alone. We expect this of ourselves. Many of us have experienced, and continue to experience, a vague,

disturbing sense of alienation, incompetence and lack of personal power. Those women who have so intensely struggled for psychological and technical autonomy find themselves unable to act, full of self-doubt, incapable of generating the energy it requires to lift projects and ideas off the ground, and lacking in self-respect. The lone woman in the male social context looks for an explanation for her feelings of defeat. But there seems to be no one or nothing on which to place the blame. We blame ourselves. There are no tangible impediments to accomplishment. The barriers are too omnipresent and too long standing to be perceived. This, perhaps more than any other reason, is why feminist theory is so important. The ubiquitousness and the very ambience of the male world is too difficult to recognize without such theories. Simon de Beauvoir was quite correct in noting that to begin to see men and their world as "the other" is the first step to a feminist consciousness.

Within such sociological thinking it should come as no surprise to a woman experiencing the distress of alientation and paralysis that her psychological nature is poorly suited to the pursuit of male enterprise as it has been defined for centuries. To find oneself floundering in the world of work created by and for men is neither surprising nor dishonorable. It is, I believe, the outcome of our capacity for personal, intimate knowledge of ourselves, others and nature itself; for empathy, nurturance, supportive interpersonal connectedness and the blurring of the distinction between object and subject. The contemporary professional workplace is poorly suited to our way of being in the world.

It is too easy to reject the male world of science as a world which does not work - or a world that is destructive to the survival of the planet's species. Science, the science created by men, has worked exceedingly well in

many domains. It is hasty and unwise to reject the entire scientific enterprise by pointing to the many social and biological problems created by that enterprise (nuclear weaponry, as the classic example). The products of both animate and inanimate science have irrevocably altered the meaning and future of human life. It is increasingly more important for women to take active responsibility for the course of science and the management of its deletorius consequences. Thus, it becomes increasingly more important to ask if women can thrive, even survive, within patriarchal science. Can women contribute to the scientific enterprise within the world that men have created? Should we even try?

As many a social activist will claim, it is the male world that has generated and perpetuated the meaninglessness and emptiness of bureaucracy in social affairs. It is this world that discovers and produces clever varieties of nerve gas and strategic nuclear weaponry. It is this world that has generated and upheld the arcane and cumbersome legal system, condones general anaesthesia during child delivery and can perform Caesarian sections almost routinely. This is a world that often seems devoid of genuine intellectual excitement, comaraderie and collective psychological spirit with a commitment to higher purposes. I, and thousands of other women, have found the professional world of men and the mixed-sexed staffs dull, empty, and dreary, lacking in the vitality and creative energy of true collective endeavor.

Maintaining productive and continuing interest in inanimate things, numbers, hypothetical constructs, mathematical equations and operational definitions is more difficult for women entering maturity after a developmental history of interpersonal connectedness and a kind of intimate way of knowing the world most men are unable to comprehend, let alone foster. Men, with a

history of struggle for autonomous self-identity can intellectually and emotionally thrive in competitive study of objects and numbers, only distantly related to human life. Patriarchal science, despite warnings from prominent scientific writers, perpetuates a devotion to the separation of object and subject, as well as control of the goal of scientific research. Many college science texts explicitly state that scientific understanding is equivalent to and derived from control. It is often explained that if the scientist can control all the variables influencing a given phenomena under study he has succeeded in understanding the phenomenon. The very word "science" implies masculinity. The popular vision of science and its corresponding masculinity and status value corresponds to deviations from the midpoint of the x-axis in Figure 1.

It is time to begin to analyze the consequences of the interpersonal social environment provided by male science, the fundamental difference between male and female psychological functioning beginning in a female-dominated infancy and the meaning of both to the future of science.

As we begin to recognize the pervasive dreariness of much of men's endeavors a place in which we once so avidly sought, we may seek to change the goals of the profession, to ask a new set of scientific questions, to teach in new ways, to develop new ways of administering medical care and dealing with the unforseen consequences of technical developments. But to attempt to do this alone, in an alien world which expects, even demands, at least the appearance of a self-in-separation may simply not be possible. We already know that, alone, it is exceedingly difficult to accomplish anything of importance. Isolated women working within the patriarchal scientific world, need other workers who are selves-in-connection. Success is not the answer. Success within male scientific culture often means nothing more than additional people to work under and for one, not with one. In many fields, success for a woman, brings nothing but more isolation.

There are fewer and fewer selves-in-relation with whom she can cooperatively work.

The question before us is what is to be done? How can women, as workers in the public sphere, make an impact on the direction of the future of our culture? Should we or can we alter the social and psychological nature of scientific enterprise that has been so long in the seemingly dangerous hands of the female-raised males of our species? How can we, as individual women living in the last decades of the twentieth century think, experiment and make changes of cultural significance while working in this alien work place?

A first step towards answering these questions is to define the various strategies women have used to enter and survive in the public sphere of work since the industrial revolution. Clearly, not all women have experienced an immobilizing despair within the patriarchal work place. There are many women who have not only survived, but have contributed significantly to scientific knowledge and technological advances that affect all our lives. We need to ask how they maintained psychological wholeness and work productivity through the choices they made in their careers. What pitfalls does each strategy hold for the individual woman and what consequence does this role have on the development of the culture?

I have known many women workers, women students, women in the process of becoming professionals, women who are just beginning their careers and women who hold prominent and respected positions in the world of work and creative enterprise. I have encountered five general strategies that women have pursued, consciously or not, towards their goal of working productively within the public sphere. Briefly these five strategies may be defined as follows: 1) Women working as invaluable support persons within male enterprise; 2) Women as "super-males"; 3) Women who marry their mentor; 4) Women who have chosen animate science for their work and 5) Women who form work collectives. An analysis of the success and weakness of each strategy for both the individual women chosing each path and for society in general follows.

The Invaluable Support Worker

The majority of women workers have support roles within male enterprise. Within nearly every example of traditional male professional organizations one finds the absolutely essential, irreplaceable female secretary, technician, administrative staff member. bookkeeper, research or teaching assistant. She is the woman who makes it all work, who makes certain that her male employer or mentor keeps his professional agreements, looks presentable to the public and feels good about himself. These women provide the underpinnings of empathetic, intelligent nurturance that, even men themselves will admit, makes their organizations work.

The woman working as a support person within patriarchal professional or business institutions often needs nc special institutional credentials, nor is she well paid. But such a role within male endeavor often brings with it feelings of collective accomplishment and of being valuable as a person. There are many women who work because they and their families require regular salary checks. There are also many women who, while in the process of supporting themselves, or their families, seek out "meaningful" work. "Meaningful" in the sense of being an important part of a larger social community of the work place. Such a role within patriarchy can often meet the psychological needs of some women.

Such a work strategy is not without its advantages. However, the benefits are nearly all of the short-run personal variety. This strategy (if one could call it such, as it implies freedom of choice) has its origins in marriage. For centuries, marriage within the economically privileged classes could guarantee a woman involvement in the public sphere through her husband's projects and powers in the public arena. We see this today in the physician's wife who vicariously experiences meaningful exchange with the world outside the home, or the politician's wife, "the woman behind the throne", exercising indirect political power through her husband.

But even a vicarious role in human enterprise can be personally meaningful and exciting. The laboratory technician or executive secretary may feel that she has an important function in making ideas into reality. The problem is that the ideas are nearly always men's ideas. Men's ideas come from a history of female-dominated infancy, a history of learning to be a self-in-isolation, a history of denying and repressing the capacity to intimately and deeply relate to other human beings and the rest of the natural world. Such a history carries with it a kind of obliviousness to the interpersonal nuances that are so central to women's lives.

It is rare that a woman doing such support work has genuine decision-making power. Her power, if she has or feels any, derives from her role as executor of patriarchal plans. While it may feel good to know that one's role in an organization is valued and truly important to the execution of its goals, this is very different from true participation in history making.

While there may be personal satisfaction, individual security and psychological well-being to be derived from such support roles, each woman who is free to choose, and chooses such a role, fails to take responsibility for the future. She fails to take responsible action with respect to what she knows. She knows that too much of male enterprise is empty of real human meaning, is ill conceived, originates in bad faith, is antithetical to enhancing the quality of human life, is oblivious to a woman's way of being and may be actually dangerous to the survival of our species. To be an "invaluable" support worker means relinquishing one's power as a woman, and as a human being, to shape the future in exchange for the false psychological comforts of "working-in-connection" with others.

Marrying One's Mentor

I have asked myself what are the critical properties of women older than myself who have had a significant impact on science and medicine. Nearly all the models that came to mind, including internationally recognized women scientists such as Rosalyn Yallow and Marie Curie, had married. That nearly all were married is not particularly striking since the majority of women of my mother's and grandmother's generation married and remained so throughout life. However, many of my models of the successful woman scientist had married men who were often already powerfully established in their fields. It is difficult to generate a long list of prominent women scientists. However, a striking majority of successful women scientists now in their 40s, 50s and 60s married their male mentor who was usually older and already established within the profession. Such a generalization may suggest that a successful strategy for holding a destiny-shaping position in the patriarchal world of science is to marry a man in one's chosen field. Often this man is a graduate school mentor.

Many of these women, when asked about the role of their husband in her professional career will freely admit to the importance of his support and intellectual involvement in her work; her work which often began as his work. It may be difficult for these women to consider the possibility that their marriage was critical in their development as thinkers, writers and creators. Despite the difficulties and setbacks of pregnancy, infant and child care, and often major responsibility for the maintenance of a household, marriage to a mentor may have been a necessary step towards power and fulfillment within the scientific world. The correlation between mentor-marriage and women's productivity in science may well reflect a possible link between female psychology and the male world of science. If marriage into the scientific endeavor increases the chances

for a woman's psychological fulfillment in her work, we need to reflect upon the long-range viability of such a strategy, both for women's lives and the future of science and technology.

The nature of scientific inquiry, the kinds of questions that are asked about the world and the kinds of solutions that are generated to solve human problems depend exclusively on the people who do the asking and the solving. The path of science depends upon the psychological histories of each new generation of scientists. If it is true that there exist fundamental differences in the basic psychological functioning of men and women, and if it is true that the gender and child-rearing arrangements that we have sanctified for millenia generate in men and women very different ways of perceiving, understanding and behaving with respect to other human beings, ourselves and nature itself, then it follows that the very nature of scientific inquiry might be of a very different character were women the originators and executors of their own plans, projects and ideas. We have no way of knowing how science and its resulting technology might be transformed were they generated by selves-in-relation rather than selves-in-separation. A feminist vision tells us that there are ways of thinking, perceiving and understanding that are as yet unknown. It is unlikely that the old, but still powerful, notion of man as conqueror of nature, as dispassionate manipulators and isolated controllers of their world would be so fundamental to scientific enterprise were it in the relational hands of women.

Women like Marie Curie or Rosalyn Yallow who are held up as our models may have derived much of their direction, persistence and emotional, technical and intellectual support from their co-worker husbands. Is there a price to pay in the wholeness of these individual women's lives: Is there a price to pay in terms of the nature of scientific pursuit? To the degree that a woman's questions and methods of inquiry resemble and derive from her husband and the patriarchal insti-

tution from within which he grew, the less chance she gives to the possibility of a new kind of science; a science not directed at conquering, mastering, reducing and sometimes destroying some part of nature. She gives up the possibility of science, like the best of science we have known, aimed at deep understanding and of the harmonious inter-relationships between human life and the rest of the natural world.

Perhaps marriage to a mentor and to his field offers the psychological and political necessities that allow a few women to participate in science and shape its future. Such a marriage may also be an essential environmental prerequisite for the kind of freedom necessary to do truly creative scientific work. However, these women, productive and energetic in the lab, may suffer a personal price that may only be ignored, overlooked or actively pushed out of consciousness. The nature of marital, sexual and intimate relationships between men and women is asymmetric. Writers such as Dorothy Dinnerstein (1976), Jane Flax (1978) and Nancy Chodorow (1978) have all argued that female-dominated infancy creates what has come to be called "heterosexual asymmetry". The way in which post-industrial revolution culture raises its male and female children nearly guarantees an imbalance in what once was thought to be the symbiosis between man and woman. Women seek out meaning in their lives through intimate relationships with others. The needs of such a female psychology which finds psychological wholeness in intimacy, mutual nurturance and deep connection with others are rarely met within the confines of heterosexual marriage, or at any level of patriarchal society.

The woman who marries into the power structure of professional work, whether by conscious decision or not, may be denying herself access to a life in connection with others, utilizing her relational capacities and knowing and being known in a way that is foreign to many men. She may have children who can fill this gap, or her busy work schedule may forever keep from consciousness a distant, disturbing unease. To choose the strategy of marriage, successful as it appears to have been,

may mean relinquishing a different kind of psychological reality and with it the chance for a feminized science that is new and fundamentally different than the scientific enterprise that has prevailed for centuries.

The "Super-Male"

There are women in nearly every work place who think and behave in a more male-like fashion than men themselves. She is more hard-nosed, more concerned with rigor and its accompanying suffering, more likely to hold up, in moral decision-making, the rules and regulations of the patriarchal institution in which she is a token. She can be as non-relational, competitive and non-nurturant as the best of men. These women learn early on how to play and win at the game of political power within her profession.

Every campus, hospital and business seems to hold within it at least one super-male. What psychological history lies behind such adult behavior can only be guessed at. A feminist psychoanalytic interpretation might include statements about the delicate balance between autonomy and intimacy during early development of self. A woman, even within female-dominated infancy, may, like her male peers, seek autonomy and separation as an escape from engulfing intimacy. Her struggle for a self that thrives in isolation and controlled mastery over things and people may lead her to deny her essential connectedness to others. She may find the social environment of patriarchal science a place to confront and re-enact these issues of deeply questioned autonomy and self-identity and discomfort within intimate relationships. Such women, active and productive as they may be, may be only serving to perpetuate the goals and hierarchical organization of patriarchal science.

Choosing Animate Science

Perhaps it is not surprising that so many of the most prominent psychoanalytic thinkers have been women. Many of the modern refinements and extensions to psychoanalytic science in the form of ego psychology and object relations theories have emerged from the observational work and writings of such women as Karen Horney, Melanie Klein, Mary Ainsworth and Anna Freud, all of whom are afforded respect by the psychoanalytic profession. The gender differences in personality structure claimed to exist by recent psychoanalytic thinkers would suggest that women should find the scientific study of the problems of human life intrinsically interesting. It has often been argued that bringing the level of our understanding of human behavior (animate science) in parity with the rapidly developing inanimate science is an increasingly more important goal.

Science requires a direct interaction between the scientist and the phenomenon under study. As technology advances this basic relation may become less direct as the experimental procedures and the quantitative methods intercede between that which is studied and the sensory experience of the experimenter. In order to observe and study the elementary particle or a supernova, many levels of machinery and computation must intercede between that which is being studied and the direct experience of the scientist. For this reason, inanimate scientific activity requires maintenance by a verbal community composed of people that share a common language and a common set of scientific goals. Such a community supports the pursuit of answers to questions that can be attained only through an interaction between machine and scientist that mediates between the personal experience of the scientist and the subject matter itself. The isolated scientist, separated from the established linguistic community of her field, has little hope of a productive, or even active, scientific career. Her exclusion on the basis of her gender and a psychology which is dependent on direct human connection serve to eliminate her.

Scientific activity which requires both machinery and mathematics between the scientist and the phenomenon under study is said to be more objective, "harder",

than science in which the scientist and phenomena come into direct contact. Such science appears to have less status and to have been feminized by the increasing proportion of women active in these fields. Woman can more readily succeed in animate science because her scientific activity is less dependent on her inclusion into a male-dominated verbal communigy.

Any attempt on the part of the scientific establishment to attract more women into the harder sciences will require more than affirmative action during a national search for a qualified individual to fill a university position, or leniency during tenure and promotion decisions, or even post-graduate scholarships for women and minorities. Women will need a work environment conducive to a self-in-connection and a verbal community of scientists ready to accept her as a peer. The environment structured by and for male psychological functioning will not suffice. As long as the child-rearing practices of our culture remain unchanged and science constructed by men who emerge from a female-dominated infancy and childhood, women scientists will need to construct their own scientific world. The formation of women's scientific collectives is a viable solution to meet this need.

Women's Collectives

Out of the Women's Movement has developed a variety of women's work collectives: women's art collectives, women's music collectives, women's legal collectives, women's psychological therapy collectives and women's health collectives, to mention a few. These collectives have been established within a feminist framework and exist to provide a different and more humanized kind of service to clients as well as a special work environment for the working members of the collective. Women's collectives are transforming the kind of legal, medical and psychological services offered to women. Women writers, artists and musicians are creating their own publishing houses, galleries, concert halls and production studios.

Women's work collectives share in common an explicit recognition, even celebration, of women as selves-in-connection with nature and human culture. Women's collectives strive to generate a work environment that women need to be creatively productive. Decision-making is collectively shared. The process by which decisions are reached is viewed as important as the decisions themselves. Power and work are evenly distributed. The power hierarchy so characteristic of male organization is opposed and often erased. The profit motive is conspicuously absent. Women's collectives strive to provide human services to people who need them and cannot afford the arrogant prices of, or even benefit from, traditional patriarchal legal, medical or psychological services. Women's collectives derive from a fundamentally different psychology, not a psychological motivation of financial progress, competition, self-aggrandizement or social power. Working towards a set of goals for the public sphere means cooperation, not competition, equal distribution of power and responsibility, not the linear system of power hierarchies; helping and understanding, not conquering and mastering.

Women's collectives have transformed the very nature of the enterprise and purpose for which they are formed. Women's music, art, and human services seem qualitatively different from their analagous traditional forms. The kind of health care offered by women's health collectives is holistically oriented, emphasizing prevention and personal responsibility for the functioning of one's body. The legal services offered by women's legal collectives are designed to inform others of their legal rights and to teach women how to use the legal structure, not be victimized by it.

Collectives of women collaborating as peers and equals pay special attention to the details of their decision-making and executing process. In so doing, they have discovered better ways to get things done. The goals of the collective are under constant scrutiny and revision. The effects of the psychological environment

generated by the collective on the well-being, creativity and productivity of each member is closely monitored. Women's work collectives have discovered new ways for people to think and act together. As more and and more groups of women join together in collective purpose and commitment, we shall see the transformation of the very meaning and cultural role of medicine, law, literature and the arts. More and more women will have a genuine opportunity to engage in productive and creative work, rather than the false opportunity afforded by many positions in the patriarchal professional world and the rhetoric of affirmative action.

Many difficulties face each collective. Economic survival of such collectives is often in question. However, during the next decades the formation of women's work collectives may be the best strategy for providing for oneself and other women a social environment in which women can truly work, can accomplish goals in the public sphere and take active responsibility for the future of our culture.

There is perhaps no area of human enterprise needing more desperately the energy and wisdom of women than science and technology. Science and technology are the very symbols of masculine identity, and, increasingly, that part of the culture having the greatest impact on every level of human life. Some of the worst threats to human survival emerge in science, technology and the industries they create. Perhaps nowhere else is the need to define psychological differences between men and women more clearly observed than in this field of human enterprise.

Male scientific organizations require enormous amounts of federal, state and private financial support for their operation. Millions of dollars are needed to provide the technical engineering and instrumentation support that lies at the very foundation of inanimate science. Most male laboratories are composed of more than just scientists. Many specialists in electronics, computers, and machinery are necessary. The scientific enterprise is unequalled in its dependence on co-ordinated group effort. Yet the cooperation and collectivism in the female sense of those words are conspicuously absent within patriarchal science. The world of

contemporary science is a world constructed for and by men. To women, it is an alien world; a world that contradicts, ignores and ridicules the female self-identity and mode of human connection.

The electronics engineer's work may be vital to the success of a project. However, he is rarely involved in the evolution of the ideas, theories and hypotheses from which the project emerged. He may be ignorant of the scientific field or the conceptual focus of the experiments for which he builds his electronic circuits. The computer programmer may concern himself only with the writing of the programs to execute a task designated to him by the "chief" of the laboratory. The lab technician may analyze the tissue samples, but be ignorant or disinterested in the scientific question being asked of those tissue samples. This is seen by many well-established scientists as the way to do science. The more personnel under one, the more federal grant support financing the work, the more productive he appears not only to others, but to himself as well.

The formation of a women's science collective might be one of the most exciting and important of social experiments. However, even if one were to conceive of science created out of a feminist vision, a science of genuine collective effort based on and created for selves-in-connection, the technical and financial obstacles are formidable. The creation and survival of other forms of women's work collectives have not been faced with the same magnitude of technical and economic barriers. Other women's collectives have not been as critically linked to technology and large scale economic support. Science and technology are dependent on their own products. Mobilized social (and economic) support from feminists and the scientific community is required for such a social experiment to succeed. While some of their products threaten our very existence, we cannot forget that science has proven itself to be one of the very finest paths to deeper human understanding,

to the extension of our perceptual experience and to the enrichment of the quality of our lives. Such a powerful tool is too useful and too dangerous to be left solely in the hands of female-raised males. Neither should we, as women, deny or suppress our special relational capacities in order to do science. We must find new ways to preserve and utilize ourselves, as selves-in-connection, while working towards the expansion of scientific knowledge and responsible control of science and technology. We can no longer be satisfied with a support role in male enterprise. Science profoundly affects the quality and meaning of the lives of women, as well as the lives of men. The power of science is too great for us, as women, to relinquish passively our responsibility for the destiny of our species.

REFERENCES

Chodorow, N. The Reproduction of Mothering: Psychoanalysis and the Sociology of Gender. Berkeley: University of California Press, 1978.

Dinnerstein, D. The Mermaid and the Minotaur: Sexual Arrangements and Human Malaise. New York: Harper and Row, 1977.

Flax, J. The conflict between nurturance and autonomy in mother-daughter relationships and within feminism. Feminist Studies, 1978, 4, 171-189.

Keller, E. F. Gender and science. Psychoanalysis and Contemporary Science, 1978, 1, 409-433.